

WHAT IS CLAIMED IS:

1. An ultrasonic diagnostic device comprising:

a volume data formation unit for transmitting and receiving  
5 an ultrasonic wave to and from a three-dimensional space containing  
a target tissue to form volume data composed of a plurality of sets  
of voxel data;

a reference line setting unit for setting a first reference  
line passing through the target tissue based on a plurality of planes  
10 set within the three-dimensional space and which intersect each  
other;

a boundary finding unit for finding a boundary of the target  
tissue by referring to voxel data along the first reference line  
and a second reference line intersecting the first reference line;

15 a shape parameter calculator unit for calculating a plurality  
of shape parameters for specifying a three-dimensional region of  
interest related to the target tissue based on the found boundary;  
and

a region-of-interest setting unit for setting the region of  
20 interest within the three-dimensional space based on the plurality  
of shape parameters.

2. An ultrasonic diagnostic device according to Claim 1, further  
comprising:

25 a reference point setting unit for setting a reference point  
determined based on a structure of the target tissue, wherein  
the reference line setting unit sets a slope of the first

reference line passing through the reference point.

3. An ultrasonic diagnostic device according to Claim 2, further comprising:

5 a plane image formation unit for forming a plane image containing the target tissue on each of the planes based on the volume data, wherein

the reference point setting unit sets the reference point based on reference point setting information input by the user using each  
10 of the plane images displayed on a display.

4. An ultrasonic diagnostic device according to Claim 3, wherein

the reference line setting unit sets a slope of the first reference line based on reference line slope information input by  
15 the user using each of the plane images displayed on a display, the reference line slope information representing a slope of a projection line of the first reference line projected onto each of the plane images.

20 5. An ultrasonic diagnostic device according to Claim 2, wherein

the reference point setting unit sets a center of mass of the target tissue which is calculated based on the volume data as the reference point.

25 6. An ultrasonic diagnostic device according to Claim 5, wherein

the reference line setting unit sets a slope of the first reference line based on boundary information of the target tissue

obtained using the volume data.

7. An ultrasonic diagnostic device according to Claim 1, wherein the plurality of planes are orthogonal to each other.

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8. An ultrasonic diagnostic device according to Claim 1, wherein the second reference line is orthogonal to the first reference line.

10 9. An ultrasonic diagnostic device according to Claim 2, wherein a plurality of second reference lines are set which is orthogonal to the first reference line and which passes through the reference point.

15 10. An ultrasonic diagnostic device comprising:  
a volume data formation unit for transmitting and receiving an ultrasonic wave to and from a three-dimensional space containing a target tissue to form volume data composed of a plurality of sets of voxel data;

20 a plane setting unit for setting three planes which are orthogonal to each other within the three-dimensional space;

a first reference line setting unit for setting a first reference line passing through the target tissue based on projected lines of the first reference line projected onto each of two planes  
25 of the three planes;

a second reference line setting unit for setting a second reference line which is orthogonal to the first reference line in

one of the planes onto which the first reference line is projected;

a third reference line setting unit for setting a third reference line which is orthogonal to the first reference line in the other of the planes onto which the first reference line is projected;

a reference line end calculator unit for calculating, based on the voxel data, a first reference line end which is an intersection of the first reference line and the boundary of the target tissue, a second reference line end which is an intersection between the second reference line and the boundary of the target tissue, and a third reference line end which is an intersection between the third reference line and the boundary of the target tissue;

an axes setting unit for setting a first axis based on the first reference line end and having a predetermined length on the first reference line, a second axis based on the second reference line end and having a predetermined length on the second reference line, and a third axis based on the third reference line end and having a predetermined length on the third reference line; and

a region-of-interest setting unit for setting a region of interest having an ellipsoidal shape in the three-dimensional space based on the set first, second, and third axes.

11. An ultrasonic diagnostic device according to Claim 10, further comprising:

a plane image formation unit for forming a plane image containing the target tissue on each of the planes based on the volume data; and

a reference point setting unit for setting, based on reference point setting information input by the user using each of the plane images displayed on a display, a reference point determined based on a structure of the target tissue; wherein

5        the first reference line setting unit sets the first reference line passing through the reference point based on a slope angle of the projected line input by the user using each of the plane images displayed on the display, and

10        the second and third reference lines pass through the reference point.

12.    An ultrasonic diagnostic device according to Claim 11, wherein the plane setting unit determines positions of the three planes based on positional information of each plane input by the user;

15    and

the plane image formation unit forms, as the plane image, a cross sectional image of the target tissue on each of the planes.

13.    An ultrasonic diagnostic device according to Claim 12, wherein

20        the axes setting unit sets, as the lengths of the first, second, and third axes, a length in which each axis exceeds the boundary of the target tissue and projects outside, and

25        the region-of-interest setting unit sets a region of interest having an ellipsoidal shape and surrounding the inside of the boundary of the target tissue.

14.    An ultrasonic diagnostic device according to Claim 13, further

comprising:

a region-of-interest judging unit for judging, based on the volume data and the region of interest, that the inside of the boundary of the target tissue extends beyond the region of interest.

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15. An ultrasonic diagnostic device according to Claim 14, wherein the region-of-interest judging unit judges that the inside of the boundary of the target tissue extends beyond the region of interest when a voxel inside the boundary of the target tissue is on the surface of the region of interest.

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16. An ultrasonic diagnostic device according to Claim 15, further comprising:

a region-of-interest corrector unit for re-setting the lengths of the first axis, of the second axis, and of the third axes when the inside of the boundary of the target tissue extends beyond the region of interest.

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17. An ultrasonic diagnostic device according to Claim 16, wherein the region-of-interest corrector unit re-sets the lengths of the first axis, of the second axis, and of the third axis based on the position of the overflowing portion of the inside of the boundary of the target tissue on the surface of the region of interest.

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18. An ultrasonic diagnostic device according to Claim 17, further comprising:

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an overflow image formation unit for forming an overflow image

in which a predetermined display process is applied to the overflowing portion of the inside of the boundary of the target tissue on the surface of the region of interest.